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From: Amelia Turner Legal Assistant to Peter B. Manzo	No. of Pages Including Cover Sheet: 28

Message:

Transmitted herewith:

- Transmittal Document; and
- Appeal Brief.

Re: Application No.: 10/033,925
     Attorney Docket No: 2001-094-NSC

Date: Wednesday, February 02, 2005

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: **Pesola et al.**   §   Group Art Unit: **2186**

                                       §

Serial No.: 10/033,925   §   Examiner: **Thai, Tuan V.**

                                       §

Filed: **December 28, 2001**   §   Attorney Docket No.: **2001-094-NSC**

                                       §

For: **Volume Translation Apparatus**
and Method

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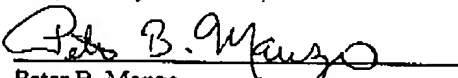Commissioner for Patents
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- Appeal Brief (37 C.F.R. 41.37).

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Respectfully submitted,

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Docket No. 2001-094-NSC   *PATENT*

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re application of: **Pesola et al.**	§	
	§	Group Art Unit: **2186**
Serial No.: **10/033,925**	§	
	§	Examiner: **Thai, Tuan V.**
Filed: **December 28, 2001**	§	
	§	
For: Volume Translation Apparatus	§	
and Method	§	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF (37 C.F.R. 41.37)

This brief is in furtherance of the Notice of Appeal, filed in this case on December 13, 2004.

The fees required under § 41.20(B)(2), and any required petition for extension of time for filing this brief and fees therefore, are dealt with in the accompanying TRANSMITTAL OF APPEAL BRIEF.

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REAL PARTY IN INTEREST

The real party in interest in this appeal is the following party:

Storage Technology Corporation of Louisville, Colorado.

RELATED APPEALS AND INTERFERENCES

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal, there are no such appeals or interferences.

STATUS OF CLAIMS

A. TOTAL NUMBER OF CLAIMS IN APPLICATION

Claims in the application are: 1-33.

B. STATUS OF ALL THE CLAIMS IN APPLICATION

1. Claims canceled: none.
2. Claims withdrawn from consideration but not canceled: none.
3. Claims pending: 1-33.
4. Claims allowed: none.
5. Claims rejected: 1-33.
6. Claims objected to: none.

C. CLAIMS ON APPEAL

The claims on appeal are: 1-33.

STATUS OF AMENDMENTS

All of the amendments to the claims have been entered. No after final amendments were made in this case.

SUMMARY OF CLAIMED SUBJECT MATTER

A. CLAIM 1 - INDEPENDENT

The subject matter of independent claim 1 is directed to a method of managing copies of virtual volume data as described on page 4, lines 3-13 of the Specification and in Figures 3A and 3B. Upon receiving an access request directed to an original virtual volume, the access request is mapped to a secondary virtual volume as described on page 12, line 24 through page 13, line 4 of the Specification and in Figures 3A and 3B. After the access request is mapped to the secondary virtual volume, the access request is performed on one or more physical volumes associated with the secondary virtual volume as described on page 13, lines 4-19 of the Specification and in Figures 3A and 3B.

B. CLAIMS 12 and 23 - INDEPENDENT

Independent method claim 1 of the present invention is representative of independent apparatus claim 12 and independent computer program product claim 23. As a result, the claimed subject matter of independent claims 12 and 23 will be found in the same locations as independent claim 1 as laid out above.

C. CLAIM 18 - DEPENDENT

Dependent apparatus claim 18 is directed to a means for redirecting the access request from a first secondary virtual volume to a second secondary virtual volume in response to a fault in a physical volume of the first secondary virtual volume as described on page 16, line 22 through page 17, line 2 of the Specification and in Figure 3B.

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GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. GROUND OF REJECTION 1 (Claims 1-6, 8-17, and 19-22)

Claims 1-6, 8-17, and 19-22 stand rejected under 35 U.S.C. § 102 as being anticipated by Kikinis et al. (U.S. Patent No. 5,964,848).

B. GROUND OF REJECTION 2 (Claims 7, 18, and 23-33)

Claims 7, 18, and 23-33 stand rejected under 35 U.S.C. § 103 as being unpatentable over Kikinis et al. (U.S. Patent No. 5,964,848).

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ARGUMENT

A.   GROUND OF REJECTION 1 (Claims 1-6, 8-17, and 19-22)

The Examiner has rejected claims 1-6, 8-17, and 19-22 under 35 U.S.C. § 102 as being anticipated by Kikinis et al. (U.S. Patent No. 5,964,848); hereinafter *Kikinis*. This rejection is respectfully traversed.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. (*In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990)). All limitations of the claimed invention must be considered when determining patentability. (*In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994)). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. (*Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983)). *Kikinis* does not identically teach each and every element of Appellants' recited claims 1-6, 8-17, and 19-22 in the current invention.

A.1.   Independent Claims 1 and 12

Independent claim 1 of the present invention, which is representative of independent claims 12 and 23, reads as follows:

> 1.   A method of managing copies of virtual volume data, comprising:
> receiving an access request directed to an original virtual volume;
> mapping the access request to a secondary virtual volume; and
> performing the access request on one or more physical volumes associated with the secondary virtual volume.

With regard to claim 1, the Examiner stated:

> As per remark, Applicant's counsel contended that (a) "The cited reference does not teach the claimed limitations of receiving an access request directed to an original virtual volume; mapping the access request to a secondary virtual volume as claimed in claim 1" (page 9, first paragraph);....
> With respect to (a) first of all, Examiner would like to emphasize that receiving access request directed to an original volume is taught as EIDE adapter which receives access request direct to the primary device 519 (column 4, lines 60 et seq.); noting that the controller firmware is the translating protocol which allows mapping of the access requests to multiple secondary IDE devices, for

example, Kikinis clearly disclose that each of the secondary IDE device having an
EIDE microcontroller and firmware to translate between the EIDE protocol and
the protocol of the particular device (e.g. see column 5, lines 19 et seq.); mapping
process is part of the translating protocol which is inherently taught by Kikinis.

(*Office Action*, dated July 13, 2004, pages 8 and 9).

Additionally, with regard to claim 1, the Examiner stated:

> The additional layer (known in the current claim 1 as a secondary virtual
> volume) is taught by Kikinis which known to be embedded within the secondary
> IDE device having an EIDI microcontroller/firmware for translating between the
> EIDE protocol and the protocol of the particular device (e.g. see Kikinis's col. 5,
> lines 19 et seq.) wherein the mapping process is part of the translating protocol
> which must included within the system of Kikinis to carry out the translating
> operation.

(*Advisory Action*, dated January 4, 2005, Continuation sheet).

Kikinis does not identically teach every element of the Appellants' current invention as
recited in claim 1. The *Kikinis* invention is in the field of peripheral device control and relates
more specifically to control of data storage devices using an Integrated Drive Electronics (IDE)
computer interface. (*Kikinis*, column 1, lines 11-14). *Kikinis* teaches, "[a]n IDE interface
communicates with peripheral devices not conforming to ST506 specification by providing
firmware to microcontrollers mounted on the non-conforming peripheral devices to translate
between the data structure of an ST506 specification device and the data structure of the non-
conforming device." (*Id.*, Abstract). "In the preferred mode for this embodiment, one primary
device and eight secondary devices can be connected to the EIDE adapter and individually
addressed by the CPU." (*Id.*, column 5, lines 3-5). "The EIDE firmware monitors the computer
bus for a request to communicate with a secondary device. If no request is forthcoming,
communication with the primary device is maintained. If (and when) there is a request on the
bus for communication with a secondary device, including data to identify the particular device,
the EIDE sends a command on the peripheral connection cable to deactivate the primary and
enable the secondary devices." (*Id.*, lines 58-67). Consequently, *Kikinis* merely teaches a
method for communicating with and switching between non-conforming secondary hardware
devices.

In contrast, claim 1 of the present invention recites a method to manage copies of virtual volume data by receiving an access request directed to an original virtual volume, mapping the access request to a secondary virtual volume, and performing the access request on one or more physical volumes associated with the secondary virtual volume. Therefore, the current invention as recited in claim 1 is for managing copies of virtual volume data and not for managing peripheral devices that do not conform to a ST506 in a data processing system as taught in *Kikinis*. There is no reference in *Kikinis* with regard to receiving an access request to an original virtual volume and subsequently mapping that request to another virtual volume for the purpose of accessing one or more physical volumes. Mapping an access request is not taught nor is the desirability of such a feature suggested by *Kikinis*.

In *Kikinis*, the secondary devices accessed by the CPU appear to be hardware devices and not characterized as virtual volumes. Instead, *Kikinis* teaches the translation of protocols and data structures of peripheral, non-conforming secondary hardware devices in order for a CPU of a host system to access those peripheral devices which are not otherwise compatible with the host system. (*Id.*, column 2, lines 28-45). "In the EIDE according to the present invention, the secondary devices can be a mix of disc drives, CD-ROM drives, and cartridge tape drives, with each having an EIDE microcontroller controller and firmware to translate between the EIDE protocol and the protocol of the particular device." (*Id.*, column 5, lines 17-21). The immediately preceding passage further demonstrates that *Kikinis* is only concerned with the management of non-conforming, peripheral hardware devices.

Conversely, Appellants' present invention recited in claim 1 is for the management of virtual volume data copies that are associated with physical volume data. No redundancy of data is taught by *Kikinis*, meaning that if a request for data on the conforming primary device were for the sake of argument mapped to one of the non-conforming secondary devices, the requested data would not be found on the secondary device. Appellants merely find peripheral, non-conforming secondary devices in *Kikinis* that differ in protocol, with no description of seeking data on one device and finding it on another, whether through mapping or otherwise. Further, the idea of mapping access requests does not appear in the *Kikinis* reference. Therefore, *Kikinis* does not teach Appellants' recited claim 1 limitation of, "mapping the access request to a secondary virtual volume; and performing the access request on one or more physical volumes

associated with the secondary volume."

Moreover, the method recited in claim 1 of the present invention provides an additional layer of functionality by mapping the original virtual volume to a secondary virtual volume to access one or more physical volumes associated with the secondary virtual volume. In other words, there are two layers of requests (original and secondary virtual volumes) before accessing the physical volumes (see Figures 3A and 3B in *Application* for illustration of this concept). By way of example:

> [t]he present invention alleviates the burden on the host machines for performing complex volume management by inserting an additional layer of functionality between the host machine applications and the data storage library. This additional layer of functionality provides volume translation so that an input/output (I/O) request to a virtual volume may have the I/O request redirected to a different set of physical volumes in the event that an original set of physical volumes is unavailable, without requiring the host machine's applications to direct the I/O request to this different set of physical volumes. In other words, the host machine's applications may still direct I/O requests to the same virtual volume regardless of whether the original set of physical volumes are being accessed or a different set of physical volumes are being accessed due to a failure. Thus, the actual physical volumes being accessed are transparent to the host machine's applications.

(*Application*, page 11, line 22 – page 12, line 9).

Kikinis does not teach the additional layer of functionality as recited in claim 1 of the Appellants' current invention. Examiner Thai stated that the EIDE adapter receives an access request direct to the primary device and that the controller firmware is the translating protocol which allows mapping of the access requests to multiple secondary IDE devices. (*Office Action*, page 8). This is demonstrative of the fact that in *Kikinis* there is only one functional layer between the primary and secondary devices and that *Kikinis* does not teach the additional layer of functionality of mapping the original virtual volume to a secondary virtual volume to access one or more physical volumes associated with the secondary virtual volume as recited in claim 1 of the current invention. Furthermore, Appellants respectfully submit that the primary and secondary hardware devices referred to in *Kikinis* are more analogous to the "one or more physical volumes" recited in claim 1 of the present invention, as opposed to the original and secondary virtual volumes proposed by Examiner Thai.

As a result of the foregoing arguments, *Kikinis* does not identically teach each and every element of the Appellants' current invention as recited in claim 1, which is representative of independent claim 12.

A.2.   Dependent Claims 2-6, 8-11, 13-17, and 19-22

In view of the above arguments, Appellants submit that each and every element of independent claims 1 and 12 of the present invention are not identically taught or suggested by *Kikinis*. Claims 2-6, 8-11, 13-17, and 19-22 are dependent claims depending on independent claims 1 and 12. Appellants have already demonstrated claims 1 and 12 to be in condition for allowance. Appellants respectfully submit that claims 2-6, 8-11, 13-17, and 19-22 are also allowable, at least by virtue of their dependence on allowable claims.

Accordingly, the rejection of claims 1-6, 8-17, and 19-22 under 35 U.S.C. § 102 as being anticipated by *Kikinis* has been overcome.

B.   GROUND OF REJECTION 2 (Claims 7, 18, and 23-33)

The Examiner has rejected claims 7, 18, and 23-33 under 35 U.S.C. § 103 as being unpatentable over *Kikinis et al.* (U.S. Patent No. 5,964,848). This rejection is respectfully traversed.

The Examiner bears the burden of establishing a *prima facie* case of obviousness based on the prior art when rejecting claims under 35 U.S.C. § 103. (*In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992)). For an invention to be *prima facie* obvious, the prior art must teach or suggest all claim limitations. (*In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). *Kikinis* does not teach or suggest all claim limitations of Appellants' recited claims 7, 18, and 23-33 in the current invention.

B.1.   Dependent Claims 7, 18, and 29

Kikinis does not teach or suggest redirecting the access request from a first secondary virtual volume to a second secondary virtual volume in response to a fault in a physical volume of the first secondary virtual volume as recited in method claim 7, apparatus claim 18, and computer program product claim 29 of Appellants' current invention. Dependent claim 7 of the present invention, which is representative of dependent claims 18 and 29, reads as follows:

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7.   The method of claim 6, wherein the access request is redirected in response to a fault in a physical volume of the first secondary virtual volume.

With regard to claims 7 and 18 the Examiner stated:

As per claims 7 and 18, Kikinis discloses the invention as claimed, detailed above with respect to claims 1 and 12. Kikinis, however, does not particularly disclose the redirecting of access request in response to a fault in a physical volume of the first secondary virtual volume.

(*Office Action*, page 6).

Additionally, with regard to claims 7, 18, and 29 the Examiner stated:

...(b) with respect to the redirecting of access request in response to a fault in a physical volume of the first secondary virtual volume Examiner realizes that Kikinis does not discloses such feature as being detailed in the office action, however concept of redirecting request is disclosed in Kikinis to server the purpose of idle state of the first secondary virtual volume (e.g. see column 5, lines 33 et seq.), NOT as in the state of response to a fault as being claimed. Accordingly, it would have been obvious to one having ordinary skill in the art at the time the current invention was made to readily recognize (a) the idle state of the primary device is read to include the fault state as being claimed, and (b) by redirecting access request to other storage media(s) when a failure of fault in the primary device, it would ensure the continuous data operational cycle without introducing any additional delay or data corruption in the system, therefore system liability is greatly enhanced.

(*Advisory Action*, Continuation sheet).

Kikinis teaches in the passage cited by Examiner Thai in the quote above:

At Power-on or Reset ... the primary IDE device enters the active state and all secondary devices enter the idle state. When the CPU issues the IDE command to select the secondary device the primary device enters the idle state according to standard IDE protocol. In a departure from standard IDE protocol, all EIDE secondary device controllers remain in the idle state. The next IDE command, called in the invention Unit Select, is a command not defined in the conventional IDE protocol, and causes the EIDE controllers to compare the transmitted Unit Select data value with the device unit number. The device having a matching unit number enters the active state. All other secondary controllers remain in idle, or inactive state. The activated device will thereafter respond to IDE commands in accordance with standard protocols.

(*Kikinis*, column 5, lines 30-45).

The excerpt above, which is exemplary of the *Kikinis* invention, does not teach or suggest that communication between the CPU and the selected non-conforming secondary device will be redirected to a second non-conforming secondary device in the event of a fault found in the originally selected non-conforming secondary device. Instead, *Kikinis* teaches that all other non-conforming secondary devices that do not have a matching device unit number will remain in an inactive state. (*Id.*). In other words, no other secondary device will be active, or become active, other than the one selected with the matching unit number. Consequently, individually selecting a secondary device by the CPU to become the active drive (*Id.*, column 4, line 66 – column 5, line 2) is distinguishable from automatically redirecting an access request from a first secondary virtual volume to a second secondary virtual volume in response to a fault in a physical volume of the first secondary virtual volume as recited in claim 7 of the Appellants' current invention.

Additionally, *Kikinis* makes no reference to the CPU accessing an alternate non-conforming secondary device if the initially selected one is not functioning or if the data contained in it is corrupted. Furthermore, Appellants agree with Examiner Thai that *Kikinis* does not disclose the redirecting of access requests in response to a fault. (*Office Action*, page 6 and *Advisory Action*, Continuation sheet). Accordingly, *Kikinis* does not teach or suggest the limitation of redirecting an access request in response to a fault as recited in claim 7 of the present invention.

All limitations of the claimed invention must be considered when determining patentability. (*In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031,1034 (Fed. Cir. 1994)). In comparing *Kikinis* to the claimed invention to determine obviousness, limitations of the presently claimed invention may not be ignored. The current invention as recited in claim 7, redirects an access request from a first secondary virtual volume to a second secondary virtual volume in response to a fault in a physical volume of the first secondary virtual volume. Such a feature is not taught or suggested in *Kikinis*. Therefore, claim 7, which is representative of claims 18 and 29, is not obvious in view of *Kikinis*.

B.2. Independent Claim 23 and Dependent Claims 24-33

With regard to claims 23-33, the Examiner stated:

> As per claims 23-33, Kikinis discloses the invention as claimed, detailed above with respect to claims 1-11 and 12-22; Kikinis however does not particularly disclose a computer-readable medium of instructions to be

implemented on a computer as being claimed in claims 23-33. However, one of
ordinary skill in the art would have recognized that computer readable medium
(i.e., floppy, cd-rom, etc.) carrying computer-executable instructions for
implementing a method, because it would facilitate the transporting and installing
of the method on other systems, is generally well-known in the art.... The
examiner takes Official Notice of this teaching. Therefore, it would have been
obvious to put Kikinis's program on a computer readable medium, because it
would facilitate the transporting, installing and implementing of Kikinis's
program on other systems.

(*Office Action*, pages 7 and 8).

Further, with regard to claims 23-33, the Examiner stated:

...(a) the computer-readable medium of instruction to be implemented on
a computer, **Examiner realized that Kikinis does not in fact discloses such
feature** as being detailed in the FINAL office action page 7 (see Examiner 103
rejection); however, one of ordinary skill in the art would have recognized that
computer readable medium (i.e., floppy, cd-rom, etc.) are widely known for
carrying computer-executable instructions to implement a method, because it
would facilitate the transporting and installing of the method on other systems,
which is generally well-known in the art; Examiner hereby again refers
Applicant's counsel to the 103 rejection for claim 23 in the FINAL office
action;.... (Emphasis added).

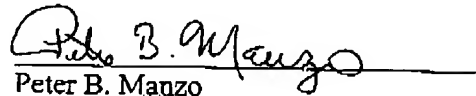(*Advisory Action*, Continuation sheet).

Claims 23-33 of the current invention are the computer program product for method
claims 1-11 and apparatus claims 12-22. Independent claims 1 and 12 are representative of
independent claim 23 of the present invention. Appellants have already demonstrated claims 1
and 12 to be in condition for allowance in Section A above. The same arguments in Section A
above are applicable to the rejection of claim 23 under 35 U.S.C. § 103 as being unpatentable
over *Kikinis* and are therefore herein applied. Thus, Appellants respectfully submit that recited
independent claim 23 is also allowable given that *Kikinis* does not teach or suggest all claim
limitations of the present invention. Claims 24-33 are dependent claims depending on
independent claim 23. Appellants have demonstrated claim 23 to be in condition for allowance
and thus respectfully submit that claims 24-33 are also allowable, at least by virtue of their
dependence on an allowable claim.

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Moreover, Appellants agree with Examiner Thai that *Kikinis* "does not in fact discloses such feature" as the computer program product recited in claims 23-33 of the current invention. (*Advisory Action,* Continuation sheet and *Office Action,* page 7). However, Examiner Thai stated that one of ordinary skill in the art would have recognized that computer readable medium carrying computer-executable instructions for implementing a method is generally well-known in the art. (*Id.*). The mere fact that a process or device utilizes a known scientific principle does not make that process or device obvious. (*In re Van De Vondervoort,* 77 F.3d 422, 425, 37 U.S.P.Q.2d 1663, ___ (Fed. Cir. 1995)). In other words, just because the Appellants' current invention employs a well-known principle, it does not make the whole invention obvious. Hence, Appellants' use of a computer program product in a computer readable medium (recited in claims 23-33) in order for the present invention to function, does not automatically render claims 23-33 obvious according to *In re Van De Vondervoort* cited above. In view of the above arguments, *Kikinis* does not teach or suggest Appellants' present invention as recited in claims 23-33.

Accordingly, the rejection of claims 7, 18, and 23-33 under 35 U.S.C. § 103 as being unpatentable over *Kikinis* has been overcome.

CONCLUSION

In view of the comments above, it is respectfully urged that the rejection of claims 1-33 not be sustained.

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CLAIMS APPENDIX

The text of the claims involved in the appeal reads:

1.   A method of managing copies of virtual volume data, comprising:

receiving an access request directed to an original virtual volume;

mapping the access request to a secondary virtual volume; and

performing the access request on one or more physical volumes associated with the secondary virtual volume.

2.   The method of claim 1, wherein the original virtual volume is associated with one or more original physical volumes, and wherein the one or more original physical volumes are different from the one or more physical volumes.

3.   The method of claim 1, wherein the original virtual volume is associated with one or more original physical volumes, and wherein the one or more original physical volumes are the same as the one or more physical volumes.

4.   The method of claim 2, wherein the one or more original physical volumes are on a first type of data storage media, and wherein the one or more physical volumes are on a second type of data storage media.

5.   The method of claim 4, wherein the first type of data storage media and the second type of data storage media is one of magnetic tape media, magnetic disk media, optical media, floppy

diskettes, CD-ROM media, DVD-ROM media, random access memory (RAM), and memory card media.

6.   The method of claim 1, wherein mapping the access request to a secondary virtual volume includes redirecting the access request from a first secondary virtual volume to a second secondary virtual volume.

7.   The method of claim 6, wherein the access request is redirected in response to a fault in a physical volume of the first secondary virtual volume.

8.   The method of claim 6, wherein the access request is redirected in response to a command to redirect the access request to the second secondary virtual volume.

9.   The method of claim 6, wherein the first secondary virtual volume includes physical volumes on a first media type and the second secondary virtual volume includes physical volumes on a second media type.

10.   The method of claim 9, wherein performing the access request on one or more physical volumes associated with the secondary virtual volume includes converting the access request to a format suitable for the second media type.

11.   The method of claim 1, wherein the access request is received using a first communication protocol and wherein performing the access request on one or more physical

volumes associated with the secondary virtual volume includes converting the access request from the first communication protocol to a second communication protocol.

12.   An apparatus for managing copies of virtual volume data, comprising:

means for receiving an access request directed to an original virtual volume;

means for mapping the access request to a secondary virtual volume; and

means for performing the access request on one or more physical volumes associated with the secondary virtual volume.

13.   The apparatus of claim 12, wherein the original virtual volume is associated with one or more original physical volumes, and wherein the one or more original physical volumes are different from the one or more physical volumes.

14.   The apparatus of claim 12, wherein the original virtual volume is associated with one or more original physical volumes, and wherein the one or more original physical volumes are the same as the one or more physical volumes.

15.   The apparatus of claim 13, wherein the one or more original physical volumes are on a first type of data storage media, and wherein the one or more physical volumes are on a second type of data storage media.

16.   The apparatus of claim 15, wherein the first type of data storage media and the second type of data storage media is one of magnetic tape media, magnetic disk media, optical media,

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floppy diskettes, CD-ROM media, DVD-ROM media, random access memory (RAM), and memory card media.

17. The apparatus of claim 12, wherein the means for mapping the access request to a secondary virtual volume includes means for redirecting the access request from a first secondary virtual volume to a second secondary virtual volume.

18. The apparatus of claim 17, wherein the access request is redirected in response to a fault in a physical volume of the first secondary virtual volume.

19. The apparatus of claim 17, wherein the access request is redirected in response to a command to redirect the access request to the second secondary virtual volume.

20. The apparatus of claim 17, wherein the first secondary virtual volume includes physical volumes on a first media type and the second secondary virtual volume includes physical volumes on a second media type.

21. The apparatus of claim 20, wherein the means for performing the access request on one or more physical volumes associated with the secondary virtual volume includes means for converting the access request to a format suitable for the second media type.

22. The apparatus of claim 12, wherein the access request is received using a first communication protocol and wherein the means for performing the access request on one or

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more physical volumes associated with the secondary virtual volume includes means for converting the access request from the first communication protocol to a second communication protocol.

23.   A computer program product in a computer readable medium for managing copies of virtual volume data, comprising:

   first instructions for receiving an access request directed to an original virtual volume;

   second instructions for mapping the access request to a secondary virtual volume; and

   third instructions for performing the access request on one or more physical volumes associated with the secondary virtual volume.

24.   The computer program product of claim 23, wherein the original virtual volume is associated with one or more original physical volumes, and wherein the one or more original physical volumes are different from the one or more physical volumes.

25.   The computer program product of claim 23, wherein the original virtual volume is associated with one or more original physical volumes, and wherein the one or more original physical volumes are the same as the one or more physical volumes.

26.   The computer program product of claim 24, wherein the one or more original physical volumes are on a first type of data storage media, and wherein the one or more physical volumes are on a second type of data storage media.

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27. The computer program product of claim 26, wherein the first type of data storage media and the second type of data storage media is one of magnetic tape media, magnetic disk media, optical media, floppy diskettes, CD-ROM media, DVD-ROM media, random access memory (RAM), and memory card media.

28. The computer program product of claim 23, wherein the second instructions for mapping the access request to a secondary virtual volume include instructions for redirecting the access request from a first secondary virtual volume to a second secondary virtual volume.

29. The computer program product of claim 28, wherein the access request is redirected in response to a fault in a physical volume of the first secondary virtual volume.

30. The computer program product of claim 28, wherein the access request is redirected in response to a command to redirect the access request to the second secondary virtual volume.

31. The computer program product of claim 28, wherein the first secondary virtual volume includes physical volumes on a first media type and the second secondary virtual volume includes physical volumes on a second media type.

32. The computer program product of claim 31, wherein the third instructions for performing the access request on one or more physical volumes associated with the secondary virtual volume include instructions for converting the access request to a format suitable for the second media type.

33.   The computer program product of claim 23, wherein the access request is received using

a first communication protocol and wherein the third instructions for performing the access

request on one or more physical volumes associated with the secondary virtual volume include

instructions for converting the access request from the first communication protocol to a second

communication protocol.

EVIDENCE APPENDIX

There is no evidence to be presented.

RELATED PROCEEDINGS APPENDIX

There are no related proceedings.